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Insurance Risk Management:

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Traditionally, asset and liability management studies are used to determine the strategic asset allocation. This strategic allocation typically focuses on the global asset categories, like fixed income, stocks and real estate. In practice, such a high-level asset mix should of course be refined to an actual asset portfolio. This process of refining the strategic allocation, also known as “portfolio construction”, is certainly nontrivial. For example, how can we make the step from a strategic “30% equities” mix to a robust multi-currency equity portfolio? And how do foreign fixed income investments fit within one’s strategic duration policy?

Such questions can be studied in detail using Ortec Finance’s Asset Liability Management (ALM) model for insurers. This model contains a special purpose module for portfolio construction. Using this tool, it becomes possible to optimize the risk and return characteristics of the investment portfolio in an asset only approach. Furthermore, this tool also makes it possible to optimize risk and return from an ALM (balance sheet) perspective.

Optimizing the investment return

Consider the situation where the range of possible assets becomes large (say, more than 20). Constructing a diversified portfolio will then typically lead to an improved risk profile, especially when correlations between different assets are low (or even negative). It is not always clear, however, which asset classes effectively improve one’s risk-return profile. Furthermore, it is difficult to assert which asset mix is optimal given a certain risk budget. Markowitz (mean-variance) optimization proves to be a valuable tool in this respect. This method selects the portfolio with the highest mean return given a certain acceptable level for the variance of the return. An example is given in figure 1, where we show a range of mean-variance efficient portfolios. It is important to note that the generated (efficient) asset

allocations are always tested in Ortec Finance’s ALM model using a realistic economic scenario set. This implies that aspects that are not taken into account in the Markowitz optimization (like non-normal distributions) are fully accounted for in the final evaluation. It is also possible to test the obtained asset mixes using additional random search methods.

One can furthermore choose to optimize the cumulative (geometric) returns instead of the ordinary (arithmetic) returns. This distinction is especially important when optimizing over a longer time span, since cumulative returns can deviate significantly from one-period returns (for example due to mean reversion in stock returns). Because Markowitz optimization is sensitive to the input data, it also makes sense to impose limits on specific asset classes (or groups of asset classes) to arrive at less extreme asset allocations (e.g. by imposing a maximum of 10% to each alternative investment).

Optimizing the surplus return

It is even possible to broaden the perspective and optimize the investment policy from an overall balance sheet perspective. In this case, not a mean-variance optimization of the investment return but an optimization of the return on the surplus is performed. In general, this will lead to better results from an overall (ALM) perspective, because the impact of the liabilities is also weighted in this case.

Some examples are given in figure 2 and figure 3. Note that the probability of a negative surplus decreases significantly (especially for the more defensive portfolios) when optimizing the surplus return. These asset mixes contain more fixed income instead of cash and therefore provide a better match with the liabilities.

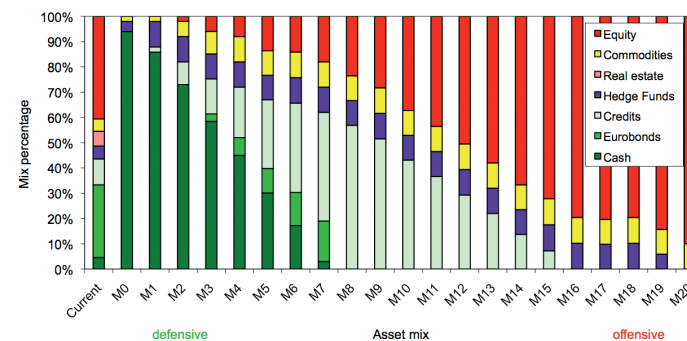


Figure 1 Portfolios generated with an ‘asset-only’ Markowitz optimization. Mix M0 is very defensive (mostly cash), M20 is very aggressive (mostly equity). Going from M0 to M20, cash is first replaced by Eurobonds and credits and then equity. The allocation to hedge funds and commodities is almost always 10% (the maximum). Real estate is not selected in his case due to a high correlation with equity and a moderate return.

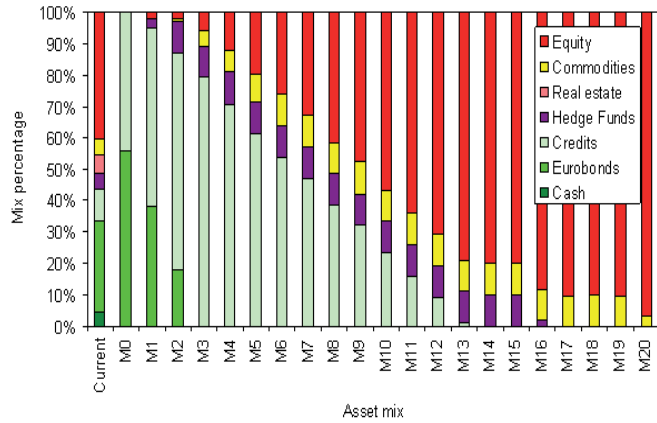


Figure 2
Portfolios generated with a 'surplus return' Markowitz optimization. The defensive mixes now consist of fixed income instead of cash, because these assets match better with the liabilities.

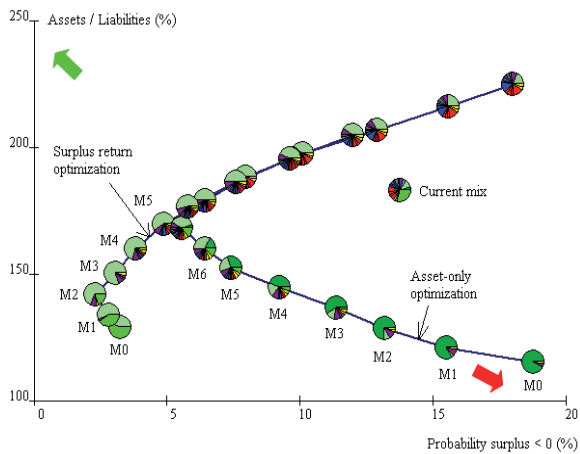


Figure 3
Risk and return for portfolios generated with an asset-only and a surplus return Markowitz optimization. The probability that the surplus becomes negative is shown on the horizontal axis; the average ratio of the assets divided by the liabilities is shown on the vertical axis. The risks reduce significantly (especially for the more defensive portfolios) when optimizing the surplus return. These asset mixes contain more fixed income instead of cash (see the previous figure) and therefore provide a better match with the liabilities.